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BMJ Open The Australian Child Maltreatment Study (ACMS): protocol for a national survey of the prevalence of child abuse and neglect, associated mental disorders and physical health problems, and burden of disease

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ABSTRACT

Introduction Child maltreatment (physical abuse, sexual abuse, emotional abuse, neglect and exposure to domestic violence) is widely understood to be associated with multiple mental health disorders, physical health problems and health risk behaviours throughout life. However, Australia lacks fundamental evidence about the prevalence and characteristics of child maltreatment, its associations with mental disorders and physical health, and the associated burden of disease. These evidence gaps impede the development of public health strategies to better prevent and respond to child maltreatment. The aims of this research are to generate the first comprehensive population-based national data on the prevalence of child maltreatment in Australia, identify associations with mental disorders and physical health conditions and other adverse consequences, estimate attributable burden of disease and indicate targeted areas for future optimal public health prevention strategies.

Methods and analysis The Australian Child Maltreatment Study (ACMS) is a nationwide, cross-sectional study of Australia's population aged 16 years and over. A survey of approximately 10 000 Australians will capture retrospective self-reported data on the experience in childhood of all five types of maltreatment (physical abuse, sexual abuse, emotional abuse, neglect and exposure to domestic violence). A customised, multimodule survey instrument has been designed to obtain information including: the prevalence and characteristics of these experiences; diagnostic screening of common mental health disorders; physical health; health risk behaviours and health service utilisation. The survey will be administered in March–November 2021 to a random sample of the nationwide population, recruited through mobile phone numbers. Participants will be surveyed using computer-assisted telephone interviews, conducted by trained interviewers from the Social Research Centre, an agency with extensive experience in studies of health and adversity. Rigorous protocols protect the safety of both participants

Strengths and limitations of this study

- This is the first Australian study of the national prevalence of all five forms of child maltreatment (physical abuse, sexual abuse, emotional abuse, neglect and exposure to domestic violence), and the co-occurrence of different types (multitype maltreatment).
- The study also measures associations between child maltreatment and mental disorders, physical health and health risk behaviours that occur throughout life, burden of disease attributable to all forms of child maltreatment and how multitype maltreatment influences overall burden of disease.
- The study is internationally significant through its use of a comprehensive, rigorously designed and tested survey instrument to obtain reliable data about the prevalence of all forms of child maltreatment and associations with health problems and risk behaviours, and enables comparison of these experiences over different historical eras.
- The study captures further nuanced information about high-risk profiles and the contextual characteristics of maltreatment, to inform future targeted public health interventions aimed at reducing maltreatment and its adverse health, behavioural and social consequences.
- While the study involves a representative random sample of the population aged 16 years and over, some subpopulations may be under-represented, including those who are homeless or living in institutions.

and interviewers, and comply with all ethical and legal requirements. Analysis will include descriptive statistics reporting the prevalence of individual and multitype child maltreatment, multiple logistic and linear regression analyses to determine associations with mental disorders

and physical health problems. We will calculate the population attributable fractions of these putative outcomes to enable an estimation of the disease burden attributable to child maltreatment.

Ethics and dissemination The study has been approved by the Queensland University of Technology Human Research Ethics Committee (#1900000477, 16 August 2019). Results will be published to the scientific community in peer-reviewed journals, scientific meetings and through targeted networks. Findings and recommendations will be shared with government policymakers and community and organisational stakeholders through diverse engagement activities, a dedicated Advisory Board and a systematic knowledge translation strategy. Results will be communicated to the public through an organised media strategy and the ACMS website.

INTRODUCTION

Child maltreatment through physical, sexual and emotional abuse, neglect and exposure to domestic violence is common worldwide.^{1 2} Systematic reviews and meta-analyses have found child maltreatment is associated with substantial adverse effects throughout life on mental health and physical health.^{3–6} A significant proportion of children experience multiple forms of maltreatment, which is especially harmful.^{4 7 8} Child maltreatment is associated with structural and functional changes to brain architecture affecting neurocognitive function,^{6 9–11} compromised educational attainment,^{12 13} maladaptive coping mechanisms such as smoking, alcohol and substance abuse,^{4 14 15} and interpersonal violence, self-harm and suicidality.⁴ The associated burden of disease is substantial, and economic costs are vast.^{16–18}

Efforts to prevent child maltreatment must be informed by reliable evidence of prevalence, characteristics and risk profiles, and evidence of associated health problems.¹⁹ Due to its gravity for health, human rights and economic well-being, child maltreatment prevention is a clearly defined international policy priority.²⁰

However, as shown by a global systematic review of nationally representative studies, few studies have been conducted anywhere that measure all five types of maltreatment across childhood.²¹ Moreover, few studies ensure questions measuring maltreatment accurately embed scientifically robust models of each type of child maltreatment, to avoid both underestimation and overestimation of prevalence.²¹

Accordingly, the international field is characterised by major gaps in evidence about the nature and characteristics of each form of child maltreatment, and of multitype maltreatment and heightened risk profiles. Australia also lacks this knowledge, as there is no nationally representative evidence of the prevalence of all types of child maltreatment, or of the nature, prevalence and timing of mental disorders and physical health outcomes associated with maltreatment, or of other associated health and behavioural outcomes. Current Australian evidence is fragmented and incomplete. Nationally representative studies have been conducted into the prevalence in young women of adverse childhood experiences and associated adult health behaviours and physical and mental health,²² and into the prevalence and burden of mental disorders

in children and adolescents.²³ A state-based birth cohort study has explored a range of health and developmental outcomes with limited analysis of maltreatment through agency records of substantiated reports, which relied on 512 children with substantiated maltreatment from a cohort of 7223 mother–infant pairs.^{24–28} Another state-based birth cohort study assessed young people's childhood victimisation and psychosocial outcomes,²⁹ and a national longitudinal study has considered parenting behaviours more generally.³⁰ However, no study has aimed to use a nationally representative sample to comprehensively measure the prevalence and nature of all five forms of child maltreatment, and their associations with mental and physical health and health risk behaviours.²¹

Finally, there is limited evidence of the burden of disease associated with maltreatment experiences. Currently, the Global Burden of Disease (GBD) estimates are limited by considering primarily childhood sexual abuse and few health outcomes, and fail to adjust for co-occurrence of maltreatment types.³¹ There is a pressing need for more comprehensive studies to better understand how maltreatment types inter-relate, and how multitype maltreatment influences overall burden of disease. In 2015, Moore *et al* published the first Australian study quantifying the national burden of mental disorders attributable to child sexual abuse, physical abuse, emotional abuse and neglect, and co-occurrence of these four types of maltreatment.¹⁸ While that meta-analysis was innovative, it could not draw on reliable nationally representative prevalence data. Moreover, exposure to domestic violence was not considered, and only three health outcomes were included. Attributable disease burden, although an underestimate, was still substantial, but there is a clear need for a more rigorous study.³

Consequently, Australia's public health response to child maltreatment has been impeded by these gaps in scientific evidence, with efforts to prevent, identify and respond to child maltreatment unable to be informed by reliable and multidimensional evidence.

The Australian Child Maltreatment Study (ACMS) addresses these three evidence gaps. First, it will generate benchmark national data showing the prevalence of all five forms of child maltreatment in Australia (physical abuse, sexual abuse, emotional abuse, neglect and exposure to domestic violence). This component of the study will also provide essential information about the nature of these experiences (including frequency and severity, and age of onset and cessation). We also measure corporal punishment, which is best understood as the 'use of physical force with the intention of causing a child to experience pain, but not injury, for the purpose of correcting or controlling the child's behaviour',^{32 33} to add to existing knowledge³⁴ in estimating its prevalence, and understanding its association with maltreatment types and health outcomes.

Second, the ACMS will generate evidence of the associated mental and physical health impacts of maltreatment at various times in adult life. We will gather diagnostic

information on key mental health disorders, and measure physical health conditions and health risk behaviours.

Third, the ACMS will provide key indicators for estimation of the national burden of disease attributable to all forms of child maltreatment and multitype maltreatment. We will combine the prevalence data with corresponding relative risks (RRs) of disease to calculate the proportion of a particular disease or condition in the population that is attributable to child maltreatment, adjusting for co-occurrence of multiple types of abuse. We will gather information on service utilisation to enable estimation of the health-related economic burden of maltreatment.

METHODS AND ANALYSIS

Study design

The ACMS involves the administration of a cross-sectional survey with a random sample of Australians aged 16 years and over that aims to be representative of the national population. The design employs a retrospective interview to obtain participants' self-reported evidence of their experiences in childhood aged up to 18 years, and of their mental health, physical health and service utilisation.

Sample selection and setting

We will use a sampling frame to obtain a representative sample of at least 8500 Australians in the general population aged 16 years and older, who can communicate in English. This will comprise at least 3500 (and up to 5000) Australians aged 16–24 years, and 1000 each in five age group strata: 25–34; 35–44; 45–54; 55–64; and 65 years and over. We employ oversampling in the 16–24 year age group to obtain higher statistical power regarding more recent Australian childhood experiences, and to facilitate comparison with future surveys of adolescents and young adults. The sample will be contacted through random digit dialling of mobile phone numbers, which has been shown in previous studies to obtain nationally representative participation.^{35 36} The source of the sampling frame is a commercial vendor database containing a complete register of Australian mobile phone numbers, as described further below.

The sample size has been calculated to ensure significance at statistical, clinical and policy levels. Our sample size calculation has been informed by estimates of rates of maltreatment types from primary population studies in the USA,³⁷ the UK,³⁸ and a meta-analysis of local non-population-based studies.¹⁸ A lifetime prevalence of 21.8% of the combined population experiencing non-penetrative sexual abuse¹⁸ indicates this prevalence could be detected with $\pm 1\%$ precision with a total sample of 6576 adults.³⁹ The number of participants for each of the five adult strata (25–34; 35–44; 45–54; 55–64; 65+ years) will be 1000, with approximately 500 men and 500 women. With these subgroup sizes, the study will be able to detect a small gender difference in prevalence of 2.6 percentage points, with power $>80\%$. Based on US data on past year prevalence of any maltreatment in children under 17

years of 15%,³⁷ we will include a larger sample for young people (approximately $n=3500$ – 5000 in the 16–24 age stratum), to allow us to detect a 2 percentage point difference in prevalence (decline to 13% or increase to 17%) providing a baseline prevalence from which trends over time can be calculated through future cross-sectional surveys with a new youth sample.

Aim and objectives

The ACMS aims to establish the prevalence in the Australian population of each of the five types of child maltreatment (physical abuse, sexual abuse, emotional abuse, neglect and exposure to domestic violence), to identify associations between child maltreatment and mental disorders and physical health, and to identify the associated burden of disease.

The objectives of the ACMS are to:

1. Generate reliable data on the national prevalence of each type of child maltreatment and of multitype maltreatment.
2. Identify key risk profiles (eg, by age, sex and other risk factors).
3. Generate new evidence of institutional sexual abuse and physical abuse.
4. Measure selected mental health, physical health and behavioural correlates in relation to patterns of child maltreatment throughout life (eg, considering each type of abuse and multitype patterns; age of onset; severity; relationship with the person inflicting the maltreatment).
5. Estimate the burden of disease attributable to child maltreatment.
6. Identify areas for targeted public health prevention and response efforts.
7. Collaborate with government and non-government agencies to translate the findings and recommendations into policy and practical reforms.

DESCRIPTION OF SURVEY INSTRUMENT

Our instrument is entitled the Juvenile Victimization Questionnaire-R2: Adapted Version (Australian Child Maltreatment Study).⁴⁰ The instrument has 17 sections (online supplemental file 1).

Maltreatment questions

The maltreatment section of our instrument is an adapted version of the Juvenile Victimization Questionnaire (JVQ), used in four national studies in the USA,^{37 41–44} and in diverse nations including the UK,³⁸ South Africa⁴⁵ and Israel.⁴⁶

Screeners questions for each type of maltreatment ask whether the participant experienced behaviourally specific acts or events. These questions capture information about the prevalence of different manifestations of each type of maltreatment and of maltreatment types overall. When a participant answers yes to a screener question, follow-up questions are asked about the characteristics of these experiences, including frequency or

duration; age of onset and cessation; and the child's relationship with the person(s) who inflicted the acts.

For sexual and physical abuse, further follow-up questions obtain information about whether the participant told anyone about their experience, including to whom disclosure occurred. Development of response categories about disclosure recipients was informed by analyses of criminal reporting laws,⁴⁷ historical analysis^{48 49} and recent updated analysis of mandatory reporting laws in child protection statutes,⁵⁰ and empirical analysis of reporting trends across Australia.⁵¹ We include disclosure questions only for sexual abuse and physical abuse for three main reasons: first, the most salient national and international scientific and policy questions around non-disclosure, delayed disclosure and the nature of responses to disclosure relate to sexual abuse (and to a lesser extent physical abuse); second, disclosure of these types of maltreatment (and responses to any such disclosure) is particularly important to child protection systems and policy, including their connection with Australian State and Territory reporting duties, which apply to some but not all maltreatment types; third, it is not viable to include disclosure questions for all maltreatment types as this would cause intolerable cost, time and participant burden.

Associations with mental disorders

We use modules from the Mini International Neuropsychiatric Interview⁵² (MINI) to obtain diagnostic information on a range of mental disorders for which child maltreatment has been identified as a causal or predictive factor. These are: generalised anxiety disorder (current); post-traumatic stress disorder (current); alcohol use disorder (current) and major depressive disorder (lifetime). While other disorders have been found associated with maltreatment and are able to be measured by the MINI, we considered relative frequency, cost, practicability and participant burden in selecting these as the most important conditions to measure diagnostically. We supplement this with measurement of other key physical health conditions and health risk behaviours.

Associations with physical health problems and health risk behaviours

The questionnaire uses modified modules from the 2007 National Survey of Mental Health and Wellbeing (NSMHW)⁵³ and tailored items to assess physical health problems and health risk behaviours. These questions capture information on self-reported health conditions (lifetime and current) including: cardiovascular disease, diabetes and sexually transmitted infections. Related questions obtain information on behavioural and lifestyle risk factors for obesity (high body mass index); tobacco use (lifetime and current); subclinical alcohol use (lifetime and current); suicidal ideation and attempts (lifetime and current); and self-harm (lifetime and current). We use the Severity of Dependence Scale for cannabis use (current).^{54 55}

Health service utilisation

Health service utilisation through hospital admissions (past year) and consultations with a range of seven broad categories of health professionals (past year) are derived from self-reports using items from the NSMHW service utilisation module. As is customary,⁵⁶ minor modifications have been made as required for the study, and to exclude COVID-19-related health service utilisation.

Other adverse outcomes

We have added sections to enable consideration of associations between child maltreatment and other important social and behavioural outcomes. We include tailored questions on involvement with the criminal justice system and out-of-home care. We employ the Composite Abuse Scale-Short Form⁵⁷ to consider participants' experience in adulthood of intimate partner violence. We include questions from the US National Child Health Survey on Adverse Childhood Experiences⁵⁸ to obtain information on parental divorce or separation; parental death; parental imprisonment; neighbourhood violence; familial mental illness; familial problematic alcohol or drug use; familial economic hardship and racial victimisation. We also include questions on corporal punishment, peer bullying and sibling violence, as these are important dimensions of adversity, and to allow for adjustment of these experiences as confounders in our analytical models for maltreatment. The peer bullying and sibling violence items were adapted from a measure validated in adult samples⁵⁹ and the JVQ.⁶⁰

INSTRUMENT DEVELOPMENT AND VALIDATION

We configured the survey instrument to suit the needs of the ACMS and the Australian context, through an extensive process of development, testing and refinement. Our development process was first informed by a systematic review and appraisal of national prevalence studies of four or five types of maltreatment.²¹ It was then informed by an updated literature review and conceptual analysis of all five child maltreatment types,⁶¹ which included review of their conceptualisation and measurement in leading epidemiological studies. Initial questions were drafted before being tested by team scrutiny and consensus. Subsequent refinements were made before field testing described below. This process built on the extensive testing of the initial JVQ as administered in the first US national study,⁴¹ and its ongoing conceptual and operational refinement through three subsequent national studies.^{37 41–44}

This facilitated the design of questions measuring child maltreatment in a way that is congruent with robust scientific conceptual models in the published literature for:

- Physical abuse: intentional acts of physical force by a parent/caregiver (excluding lawful corporal punishment, which is assessed separately).⁶²
- Sexual abuse: contact and non-contact sexual acts by any adult or child in a position of power over the

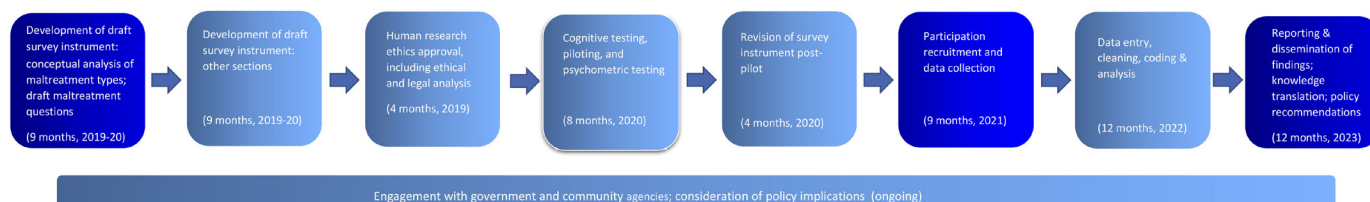


Figure 1 The Australian Child Maltreatment Study flow chart.

victim, to obtain sexual gratification for the person or another person whether immediately or deferred in time and space, when the child either does not have capacity to provide consent, or has capacity but does not provide consent.⁶³

- ▶ Emotional abuse: parental behaviour, typically repeated, that conveys to the child they are worthless, unloved, unwanted or only of value in meeting another's needs, exemplified by acts of hostility, terrorising, rejection, isolation, corruption and denying emotional responsiveness.^{64 65}
- ▶ Neglect: parental failure to provide a child with the basic necessities of life as suited to the child's developmental stage and as recognised by the child's cultural context.⁶⁶
- ▶ Exposure to domestic violence: witnessing (through seeing or hearing) a parent/family member subjected to assaults, threats or property damage by another adult/teenager who normally lives in the household; also includes other forms of interparental coercion.^{57 67}

Validation

After initial development, the draft instrument was tested in a multistage process that is rarely reported in large-scale child maltreatment surveys⁶⁸ (figure 1).

Independent expert review

Our conceptual approaches and draft questions were reviewed by 15 members of our international Technical Expert Panel, which comprises leading experts on the five maltreatment types, and on maltreatment surveys, for face validity, conceptual validity and cultural appropriateness. Feedback informed revisions by team consensus.

Review by survivors of maltreatment

To assess face validity, comprehension and potential for distress, screener items were reviewed by four people who had experienced maltreatment.

Cognitive testing

In March–April 2020, the Social Research Centre's qualitative research unit conducted two rounds of cognitive testing with 13 purposively selected participants, representing diverse age groups, genders, socioeconomic and educational backgrounds, and ethnicities. The ACMS lead investigator instructed and observed in person. Each interview took approximately 1 hour.⁶⁹ The two rounds with eight and five participants, respectively, allowed

amendments to be made after the first phase, and tested in the second.

Cognitive testing assessed how participants understood and responded to questions, to identify words, phrases and concepts that may pose difficulties for cognitive processing and accurate response.^{70 71} We examined aspects of questions and response frames that participants may have misunderstood, found unclear or found difficult to answer. We also tested for distress and ease of recall. Alternative phrasing and response frames were trialled to improve comprehension and speed of response. Findings supported further refinements to ensure results will be valid, reliable and complete. Examples of this include revisions of wording to enhance the clarity of screener questions on generalised sexual harassment and internet sexual victimisation.

Pilot study, including test–retest reliability analysis

We then administered a full pilot of the survey instrument. This was administered by trained interviewers in standard survey mode using computer-assisted telephone interviewing (CATI) and the programmed software platform. The pilot was administered at time 1 to 100 participants recruited via random digit dialled mobile phones. At time 2, 3–4 weeks later, the maltreatment items were administered again, with 74% of the time 1 sample.

Pilot data processing and analysis

Data were processed and analysed in Stata/MP V.16.0 for Windows and in Mplus V.8.1.

The survey instrument performed well in pilot testing. In forthcoming work, we report full details of the process of developing and testing the modified instrument, which will include comprehensive psychometric data. Due to the interview format, there were no missing data. Item refusal rates were low with most items having no refusals. Estimated frequencies for maltreatment types were generally within expected ranges. Percentage agreement at time 1 and time 2 was high for individual screeners and for each maltreatment type. Test–retest analysis using Cohen's kappa indicated very good reliability. We used area under the curve analysis to further assess test–retest reliability and McDonald's omega to measure internal consistency. While less important for assessing maltreatment,⁴¹ internal consistency as indicated by Cronbach's alpha was strong (any maltreatment) and moderate to strong for each maltreatment type. Estimates of prevalence

for other components of the instrument were within expected ranges.

Distress and referral protocols were administered successfully with no adverse incidents. Few participants found the survey upsetting. In monitoring interviewers' welfare, we found no adverse incidents or broader concerns.

MAIN STUDY

Recruitment/procedures

All interviews in the ACMS will be conducted by trained interviewers using CATI, as piloted. This method is optimal considering geography, time, cost and participant protection.²¹ Depending on participants' responses, the average duration of interviews is approximately 30 min.

The sample will be selected by random mobile phone number generation, using a commercial vendor sample (SamplePages) which includes numbers from the Australian Register of Numbers. Random digit dialling of the ending numbers enables listed and unlisted numbers to be contacted. To enhance response rates, an advance text message will be sent to each selected number within the week before being telephoned, identifying the caller as 'Queensland University of Technology (QUT)', and providing information about the forthcoming invitation to participate, the study and a link to the ACMS website. The purpose of the advance text is to provide information about the ACMS, and to establish age eligibility by inviting the person to indicate whether they are under or over age 16 years. It also enables a prospective participant to opt out, allowing cost-effective exclusion of non-productive phone calls.

Patient and public involvement

Patients are not involved in this research. As described in our Validation section, a diverse range of members of the public participated in cognitive testing and the pilot study, with findings from both these stages informing refinements to the final instrument. Ongoing consultation with expert interviewers from our partner research agency also informed refinements to the instrument. Members of our international Technical Expert Panel reviewed core elements of project design to confirm and refine approaches to maltreatment screeners and follow-up questions. Facilitated by our Advisory Board, we have to date delivered 15 presentations about the ACMS to government and non-government audiences throughout Australia to ensure ongoing awareness of the ACMS, and these will continue throughout the project. Members of our Advisory Board are continually involved in the planning of optimal dissemination of this research and in identifying important topics for analysis. We will use our website to inform ACMS participants and the public about project outcomes through information sheets and summary reports. Media reports will also present main outcomes for the public.

Planned analysis

Sample representativeness, weighting and item non-response

Sample representativeness will be assessed in three ways: (1) by comparing the sample distribution with the Australian population based on the Australian Census of Population and Housing using demographic questions common to the survey instrument and the census; (2) by comparing the sample with comparable items from other large-scale nationally representative surveys including the Australian Survey of Mental Health and Wellbeing; and (3) by analysing response patterns by survey characteristics including geographical area and number of calls required to make contact. Non-response analysis will follow a demonstrated methodology.³⁷ Post-stratification weights will be derived to adjust for any non-response patterns identified in these analyses to ensure that the sample is aligned with external population distributions for key demographic variables. Weights will be derived using the generalised raking method.⁷² Weighted estimates will reflect the population structure by age, sex and other demographic characteristics.

As the questionnaire will be administered by trained interviewers, it is anticipated the amount of item-level missing data will be very low for many items. Where the amount of missing data is small (less than 1% of survey responses), the benefit of multiple imputation is trivially small compared with the impact of weighting and overall non-response, so a single random hot-deck imputation will be used. Where the amount of missing data is greater than 1%, a theoretical and empirical assessment will be undertaken of whether it is reasonable to assume the data meet the missing at random assumption of multiple imputation procedures. For instance, it is possible that respondents who do not answer questions about sexual assault may be qualitatively different from those who do (for example, due to feelings of embarrassment). Where it is reasonable to assume the data are missing at random, multiple imputation will be undertaken using method of chained equations.⁷³ For variables where there is reason to suspect systematic bias in refusals, the 'don't know' or 'refused' category will be treated as a separate category in the analysis. For transparency of reporting prevalence estimates of maltreatment types, we will report both conservative estimates based on assuming refusals did not suffer maltreatment, as well as estimates produced using the imputation procedures.

Maltreatment prevalence measurement

The proportion of the population to have experienced each type of maltreatment will be generated by calculating descriptive frequencies. Occurrence by age and gender will be compared using cross-tabulations and χ^2 tests. Depending on cell sizes, we anticipate also conducting analyses by socioeconomic status, sexuality, out-of-home care involvement and ethnicity. Proportions of co-occurrence of multiple types of maltreatment will be estimated. For those aged 16–17 years old, results may under-represent the experience of some types of

maltreatment since retrospective self-report will not span the entire period of childhood up to 18 years. Other prevalence studies with children aged under 18 years do not make statistical adjustments to accommodate this and present estimates of combined samples with an implicit acknowledgement of this limitation.^{37 38} We will generate estimates for the entire sample but can also examine those aged 16 and 17 years old separately from those 18–24 years old, and from the entire sample. Data we obtain on the mean age at which the abuse last occurred will also allow us to statistically model patterns of abuse using the data provided by the other participants.

Associations with mental disorders, physical health and other adverse outcomes

We will measure these associations across adult life for each type of maltreatment, for multitype maltreatment, and by analysing trends among subgroups including age at exposure and gender. Bivariate analyses using logistic regression will determine significant associations between child maltreatment and health, behavioural risk factors, health service use, criminal justice and educational outcomes. Potential associations with outcomes that have been theoretically linked with maltreatment from previous literature will be analysed using multivariate analyses controlling for demographic characteristics and potential confounders to determine independent associations.

A second set of equations will be estimated to examine the contributions of different types of maltreatment and calculating unique and shared variance for each child maltreatment subtype in predicting health outcomes. Multivariate analyses will be conducted as appropriate for the type of outcome variable, including using binary logistic regression to identify relative associations depending on different characteristics of each type of maltreatment, including age and relationship with the person inflicting the acts, ordinal logistic regression to examine associations with severity of maltreatment, Poisson regression for frequency of maltreatment events, and interval censored survival techniques to examine time between occurrence of maltreatment and subsequent health outcomes. To avoid overestimating attributable burden, ORs will be converted to RR estimates for use in population attributable fraction (PAF) calculations following established methods.^{18 74}

Estimating disease burden attributable to child maltreatment

We will pair the RRs of disease for individual and combined exposure states of multitype maltreatment with corresponding prevalence estimates, to calculate the PAFs for related health outcomes.⁵ These PAFs will then be applied to estimates of the burden of disease in Australia from GBD for various related conditions measured in years of life lost due to premature mortality, years lived with disability and disability-adjusted life years, as a measure of overall disease burden by age, sex and year to estimate attributable burden. This methodology

has been detailed in research calculating the burden of anxiety and depressive disorders attributable to bullying victimisation in childhood.⁷⁴ Analysis of health service utilisation data will also contribute to estimation of the health-related economic burden of maltreatment. Health service costs will be estimated from self-reported data including consultations with a general practitioner and other healthcare professionals, as well as hospitalisations for direct injury consequences of child maltreatment such as injuries and self-harm as well as other long-term physical and health consequences. Health services will be valued in line with Australian Federal Government reimbursements via the Medicare Benefits Schedule and the Independent Hospital Pricing Authority National Hospital Cost Data Collection.

DISCUSSION

This protocol outlines the ACMS approach to measuring child maltreatment in a national population, and its associations with mental disorders and physical health, and burden of disease. Much international work has been conducted in this field, and the ACMS aims to make further contributions to inform subsequent research of the highest rigour. The ACMS is designed to generate the first benchmark data of child maltreatment prevalence at the population level in Australia. It also contains measures enabling repeated studies with separate samples of participants aged 16–24 years old to measure trends over time; these include asking those aged 16–17 years old about prior year experiences as well as experiences over their entire childhood. The ACMS has also been designed to facilitate studies with a cohort from this original sample. Participants are asked if they would be willing to be recontacted for the purpose of participating in future connected studies. Such studies could include data linkage studies to measure selected outcomes in more detail. More significantly, they could include studies to monitor outcomes of interest over the long term.

Participant safety

Legal and ethical considerations have been carefully considered to ensure confidential participation, while supporting any participant who experiences distress or who is at imminent risk of significant harm.⁷⁵

We employ a comprehensive protocol to minimise the likelihood of distress, and to respond to any reported distress, informed by leading studies in this field.^{76–78} Interviewers will be trained to use the distress protocol and to refer participants to more extensive support if necessary. Every participant will be provided with the phone number of a counselling and support service.

We employ a structured protocol to respond to any participant who is at risk of further abuse or imminent significant harm. The protocol meets best practices in the field and complies with the Australian National Health and Medical Research Council Statement.⁷⁹ It is further informed by our analysis of reporting duties in criminal

law,⁴⁷ tort law,^{80 81} child protection law,^{48–51} and of ethical duties to research participants generally⁸² and to those aged 16–17 years.^{83 84} Depending on the circumstances, this may involve offering access to extensive counselling support, or referral to a relevant child protection agency or service organisation. In all cases, participants' interests in confidentiality and autonomy are balanced with any clear need for protection.

These protocols involve multiple complex scientific, legal and ethical questions, and full analysis and explanation requires separate comprehensive treatment. To support the translational impact of our participant safety protocols, we will publish separate articles which provide this comprehensive analysis, and in those works we will include the protocols as supplemental files.

Mobile phone administration

The ACMS will be conducted with participants on mobile phones only. This approach offers added privacy, speed and directness of contact with eligible participants, and consistent use of advance text invitations. Moreover, while recent surveys have used CATI for nationwide studies using dual frame samples of landline and mobile phones,^{35 36 85–87} mobile-only administration is now recommended for national studies, particularly for participants aged under 75 years,⁸⁸ due to phone usage trends.^{89–91} Data on phone usage show: a continual increase in mobile phone ownership (over 35 million mobile phone services in a population of approximately 25 million); substantial decline in landline ownership (under 50% of adults, and five times fewer services than mobiles); and almost exclusive mobile phone use in younger demographics.^{89–91} These trends show constant trajectories, indicating an approach using mobile phones only is optimal in our 2021 fieldwork period.

Limitations

Despite its strengths, the ACMS has limitations. First, the cross-sectional retrospective self-report design is limited to measurement of associations, not causality. However, there is evidence of a causal association between child maltreatment and mental disorders, self-harm and substance use, supported by the Bradford Hill Criteria,⁵ and the ACMS makes new contributions by deriving RR estimates for single as well as combined multiple forms of maltreatment, and consideration of the effect of severity and frequency of maltreatment on outcomes. The ACMS enables consideration of other adversities that may be within the causal pathway to account for confounding. Also, given that the ACMS is cross-sectional, we are unable to measure individuals' mental and physical health over the life-course. However, we can compare associations between child maltreatment and different outcomes across different age groups. Despite its limitations, this is an appropriate way of being able to estimate the mental and physical health impacts of child maltreatment.

Second, retrospective self-report studies are subject to recall bias and inaccuracy.⁹² However, people can readily

recall incidents of childhood maltreatment, especially when the survey instrument employs clear, behaviourally specific items,^{92–94} and rigorously designed retrospective self-report studies can have greater sensitivity than prospective studies.⁹² In addition, recall biases generally lead to underestimates, rather than overestimates. The JVQ has been carefully designed to capture both prevalence data and nuanced details from follow-up questions about maltreatment experiences. Its repeated reanalysis and use over time in multiple studies with children, youth, and young adults aged 18–24 years provides confidence in its soundness and suitability for the ACMS, and justifies its selection. While the ACMS includes an over-sample of participants aged 16–24 years old, its sample includes participants of higher ages than those in which the JVQ has typically been employed. Accordingly, we made small modifications to some of the follow-up questions' response options to accommodate the different age sample in the ACMS and their recall covering a longer temporal period. These modifications enable comprehensive data capture for these variables and were tested in piloting. An example of this is that where a participant cannot recall an age of onset or cessation, they may indicate this by school age (before beginning school; in primary school; at high school). Further comprehensive treatment of the process of instrument configuration and testing will be provided in forthcoming work.

Third, while the sampling frame should achieve broadly representative participation, some hard-to-reach and marginalised subpopulations may be under-represented. We anticipate under-representation of people who are homeless or in detention, although this would lead to more conservative estimates. In addition, Indigenous Australians and culturally and linguistically diverse communities may be under-represented, as is usually the case in surveys of random samples of the Australian population.^{35 95} Depending on participation rates, some subpopulations may require the application of statistical weights and adjustments.²⁴

ETHICS AND DISSEMINATION

The ACMS has been reviewed and approved by the QUT Human Research Ethics Committee (#1900000477, 16 August 2019). Results will be shared with government policymakers and community and organisational stakeholders through diverse engagement activities, including through the ACMS Advisory Board. Findings will be communicated to the public through an organised media strategy through television, radio, online and social media. Results will be published in peer-reviewed journals and technical reports, presented in scientific meetings, and communicated through targeted national and international scientific networks including through the ACMS Technical Expert Panel. All major outcomes will also be made available on the ACMS website. Under a registered data management plan, final data sets will be stored on the Australian Data Archive, with details made available

on the ACMS website. The survey instrument will be placed on the study website and made available through a Creative Commons licence (figure 1).

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